

Oral Hygiene Status and Gingival Status of the 12- to 15-year-old Orphanage Children Residing in Delhi State: A Cross-sectional Study

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ABSTRACT

Aim and objective: To assess oral hygiene status and practices among 12- to 15-year-old orphanage children in Delhi State, India.

Study design: In this cross-sectional study, a one-stage cluster sampling design was carried out with orphanages as a cluster unit to assess oral hygiene status and practices among orphanage children in Delhi state, India.

Results: The majority of the orphanage children had good oral hygiene status (53.8%) followed by fair (32.3%) and poor (13.9%) oral hygiene status. A large proportion (48.3%) of the orphanage children had mild gingival status followed by moderate (34.9%) and severe (16.8%) gingival status. No statistical difference was reported for the distribution of oral hygiene status and gingival score across all the age-groups. Most (53%) of the orphanage children among all age-groups had good plaque status. The correlation of gingival index (GI) scores with plaque index (PI) score and oral hygiene index-simplified (OHI-S) scores showed a significant correlation of GI scores with PI scores ($r = 0.815$) and OHI-S scores ($r = 0.799$).

Conclusion: The oral hygiene practices and oral hygiene status along with gingival status were found to be satisfactory among orphanage children in the present study.

Clinical significance: Gingival and periodontal diseases have a high prevalence among orphanages because of poor hygiene practices. Untreated oral diseases could lead to general health problems. Thus, the preventive strategies can be planned with the exact knowledge of the oral hygiene status of these special needs children in Delhi state.

Keywords: Brushing frequency, Gingival status, Oral hygiene status, Orphanage children, Plaque status.

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INTRODUCTION

The future of any nation are children and to strengthen a nation, a healthy, protected, educated, and well-developed child population that will grow up to be productive citizens of the country is a must.¹ The primary caretakers and saviors of a child are parents but woefully there are thousands of children who lead their lives without one. The parents of such children are either being dead or incapable of their upbringing and such section of children in society are termed as "orphans".^{1,2} An orphan is a child who has either lost one or both parents. In the Islam religion, children of unknown parentage are also included in this definition.³

Due to unemployment, increased migration of families, broken families, increasing poverty, neglect, abuse and violence, armed conflicts, natural and man-made disasters, decreasing resources in rural areas, and the attraction of cities, a majority of these children are placed in orphanages.^{4,5} They are the vulnerable group of children facing numerous challenges such as a high risk of poor health.⁶

According to a recent United Nations International Children Emergency Fund (UNICEF) report, there are between 143 million to 210 million orphans in the world and nearly 87.6 million are in Asia alone.⁷ India constitutes a major part of the under 18-year population (UNICEF 2005) been the second most populated country in the world.^{8,9} Of the total child population in the year 2010, 6.8%, i.e., 25,000,000 were estimated to be orphans.^{1,2,8,9}

Orphans being a deprived community have little control over their own lives. Non-governmental organizations (NGOs) or social workers take care of these orphans with limited funds and support

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to provide them with the basic amenities of life like food, shelter, clothing as well as education and health.^{6,7} The pattern of living in an orphanage is entirely different from living with family. Therefore, it has been hypothesized that children residing in orphanages since being underprivileged have a different pattern of oral diseases and quality of life and receives no similar care as other children do from their parents.^{10,11}

The orphanage children are at an increased risk of developing oral diseases and disorders as it is one of the unmet healthcare which give rise not only to physical but also to economic, social, and psychological problems that impair the quality of life.⁶ Several factors contributing to these unmet healthcare needs among orphans are, lack of availability of dental healthcare services, financial resources, lack of perceived needs for dental care, less motivation by caretakers, low priority given to dental care when compared with general health and finally the cost of treatment puts them on the potential risk of poor general as well as oral health.^{7,11,12}

A high prevalence of gingival and periodontal diseases has been observed in children of orphanages. Oral hygiene practices are very poor among this group. Untreated oral diseases could lead to general health problems. Recognition of these problems is essential to provide optimum oral health for these deprived children.¹⁰

Many studies have evaluated the oral health status and treatment needs of different high-risk groups like the mentally challenged, physically handicapped, geriatric population but there is a paucity of studies describing the oral health status and oral hygiene practices of orphanage children in India. So, the current study was aimed at assessing the oral hygiene status and practices among orphanage children in Delhi State, India.

MATERIALS AND METHODS

The current study was carried out to assess the oral hygiene status and practices of 12- to 15-year-old children residing in orphanages in Delhi state. Sample size estimation was derived from the pilot study which was done in one of the orphanages in Delhi and was calculated to be 900 and to avoid bias, the participants of the pilot study were not included again in the main study.

Study Design

At the beginning of the study, the list of all the orphanages in Delhi state was obtained from the Department of Social Justice and Empowerment, and the Indian Orphanage Network Children's helpline which comprised 63 orphanages. After obtaining the complete addresses and telephone numbers of the orphanages, the number of working orphanages was determined to be 54. The study sample was collected using a cluster sampling design with orphanages as a cluster unit.

Inclusion and Exclusion Criteria

The systemically healthy orphanage children in the age-group of 12 to 15 years who were willing for examination and also gave verbal consent were included. Inmates who were undergoing orthodontic treatment and other conditions that interfere with the clinical oral examination were excluded. Also, inmates, who had un-erupted index teeth for oral hygiene index-simplified (OHI-S), gingival index (GI), and plaque index (PI) were excluded along with differently-abled inmates.

Ethical Considerations

The study protocol was reviewed and ethical clearance was sought from the Ethical Committee. The written permission to examine the oral cavity of these children was obtained from the concerned authorities of the orphanages. Before the examination, verbal consent was taken from every subject.

Training and Calibration of the Examiner

The clinical examination of all the study subjects was done by a single examiner who was trained and calibrated in the Department

of Public Health Dentistry. The intra-examiner variability was checked by performing the repeat examination of 10% randomly selected subjects and intra-examiner reliability was assessed using kappa statistics. The kappa values ranged from 0.78 to 0.83 for oral hygiene status, plaque scores, and gingival scores.

Data Collection

Data were collected by a combination of a structured interview and clinical examination. The data were recorded on a pretested, validated, structured pro forma with open- and close-ended questions. A structured interview was conducted to collect information on demographic characteristics (name, age, and gender), and oral hygiene practices (frequency, method of cleaning teeth, type of material used) of the study population.

On completion of the interview, the clinical oral examination for the oral hygiene status of orphans was assessed using OHI-S given by Greene and Vermillion,¹³ and PI given by Silness and Loe.¹⁴ The gingival status was assessed using the GI given by Loe and Silness.¹⁵

Statistical Analysis

The data were recorded and transferred from the assessment form to the computer and the master chart was created in the excel sheet using Microsoft Excel Software. The SPSS version 16 software was used for the statistical analysis. The data were summarized in the form of mean and standard deviation for numerical data, and frequencies and percentages for categorical data.

The normality of the data was checked using Shapiro–Wilk's test. For those variables which failed to achieve normal distribution for the inferential statistics, the non-parametric tests were used. Mann–Whitney *U* test was used for comparison of the mean values between two groups and for comparison of the mean values between three or more groups the Kruskal–Wallis test was used. The distribution of the categorical variables was compared using the Chi-square test. The *p* value of <0.05 was considered to be statistically significant.

RESULTS

The study population consisted of 626 (69.6%) males and 274 (30.4%) females. There were 304 (33.78%) subjects from 12 years of age-group, 279 (31%) subjects from 13 years of age-group, 159 (17.67%) subjects from 14 years of age-group, and 158 (17.55%) subjects from 15 years of age-group.

The majority of the orphanage children (720, 80.0%) cleaned their teeth once a day, followed by twice a day (168, 18.7%), irregularly (11, 1.2%), and only 1 (0.1%) subject cleaned teeth more than two times a day. Cleaning of teeth once daily was significantly more among 12-year (250, 82.2%) and 15-year (133, 84.2%) age-groups in comparison to 13-year (209, 74.9%) and 14-year (128, 80.5%) age-groups whereas the irregular frequency of cleaning teeth was reported to be significantly more among 12-year-old orphanage children (10, 3.3%) in comparison to 13-year (1, 0.3%), 14-year (0.0%), and 15-year (0.0%) age-groups. Twice daily was significantly more among 13-year (68, 24.4%) age-groups. Cleaning of teeth once daily and irregularly was reported to be significantly more among males (517, 82.6% and 10, 1.6%, respectively), whereas twice daily was significantly more among females (70, 25.5%).

A toothbrush was used by the majority (899, 99.89%) of orphanage children for cleaning their teeth including male (625, 99.8%) and female (274, 100.0%) orphanage children. The majority (897, 99.7%) of the subjects were using toothpaste for cleaning their teeth followed by toothpowder (3, 0.3%).

Oral Hygiene Status

Most of the orphanage children had good oral hygiene status (53.8%) followed by fair (32.3%) and poor (13.9%) oral hygiene status. Good oral hygiene status score was found to be more among 13-year-old orphanage children (60.2%), the fair was more among 15-year-old children (41.1%), and poor oral hygiene status was reported to be more among 12- and 15-year-old orphanage children (15.5% and 14.6%, respectively) with no statistically significant difference across the age-groups (Table 1).

The genderwise comparison of oral hygiene status showed that fair (34.2%) and poor (15.7%) oral hygiene status was significantly more among males and good (62.0%) oral hygiene status was significantly more among females (Table 1).

The mean OHI-S score was 1.51 ± 1.30 among orphanage children. The mean oral hygiene was found to be maximum among 15 years old (1.68 ± 1.16) followed by 12 years old (1.56 ± 1.42), 14 years old (1.51 ± 1.21), and least among 13-year-old orphanage children (1.36 ± 1.26) with no statistically significant difference across the age-groups. The mean OHI-S score was poor among males (1.64 ± 1.33) when compared with females (1.23 ± 1.16) with no statistically significant difference between them (Table 1).

Plaque Status

Most (53%) of the orphanage children had good plaque status. Excellent plaque status was found to be more among 13 years of age-group orphanage children (29.4%), good (58.2%), and fair (24.7%) were more among the 15-year-old age-group and poor plaque status was found more among 14 years of age-group orphanage children (3.8%). The excellent score was significantly more among females (31.8%) whereas good (55%), fair (24%), and poor (2.4%) plaque status scores were significantly more among males (Table 2).

Mean PI scores were maximum among 15 years (0.75 ± 0.51) of age-group followed by 12 years (0.70 ± 0.54), 14 years (0.70 ± 0.57), and with least among the 13-year age-group (0.63 ± 0.58) with no statistically significant difference across the age-groups. The mean plaque score among males (0.73 ± 0.55) was significantly more as compared to female orphanage children (0.58 ± 0.54) (Table 2).

Gingival Status

Most (48.3%) of the orphanage children had mild gingival status. The prevalence of gingival status score across the age-groups has statistically no significant difference (p value > 0.05). Mild gingival status was found to be more among 13 years old orphanage children (53.8%), moderate was more among 15 years old (41.8%), and severe was more among 12 years old (18.5%). Mild gingival status was found to be significantly more among female orphanage children (57.3%) whereas moderate (37.4%) and severe (18.2%) gingival status score was found to be significantly more among male orphanage children (Table 3).

Mean GI score was found to be maximum among 15-year (0.48 ± 0.54) age-group and least among 13-year-old orphanage children (0.38 ± 0.55) with no statistically significant difference across the age-groups. Among males (0.49 ± 0.60) in comparison to females (0.32 ± 0.49), the mean GI score was significantly more (Table 3).

Correlation between GI Scores with PI Score and OHI-S Scores

The correlation of GI scores with PI score and OHI-S scores showed that a significant correlation of GI scores with PI scores ($r = 0.815$) and OHI-S scores ($r = 0.799$).

A statistical difference was seen for the mean OHI-S score, PI score, and GI scores according to the frequency of cleaning teeth. The mean OHI-S score, PI score, and GI score were significantly better among subjects who were cleaning their teeth two or more times a day as compared to once daily and irregular frequency of cleaning their teeth (Table 4).

DISCUSSION

Orphans are those children who have lost either one or both parents.¹⁶ In India, NGOs or social workers take care of orphanage children without realizing that oral health is an integral part of children's overall well-being.⁷ However, to date, relatively few studies have been conducted on orphanage children.

In the present study, most (80%) of the children cleaned their teeth once daily, followed by twice daily (18.7%), irregularly (1.2%),

Table 1: Distribution of oral hygiene index-simplified (OHI-S) scores among different age-groups and gender

Age category	OHI-S status			Total N (%)	OHI-S Mean \pm S.D.
	Good n (%)	Fair n (%)	Poor n (%)		
12 years	162 (53.3)	95 (31.2)	47 (15.5)	304 (100.0)	1.56 \pm 1.42
13 years	168 (60.2)	76 (27.2)	35 (12.5)	279 (100.0)	1.36 \pm 1.26
14 years	84 (52.8)	56 (34.6)	20 (12.6)	159 (100.0)	1.51 \pm 1.21
15 years	70 (44.3)	65 (41.1)	23 (14.6)	158 (100.0)	1.68 \pm 1.16
Total	484 (53.8)	291 (32.3)	125 (13.9)	900 (100.0)	1.51 \pm 1.30
		p value ^a = 0.054 [#]			p value ^b = 0.535 [#]
Male	314 (50.2)	214 (34.2)	98 (15.7)	626 (100.0)	1.64 \pm 1.33
Female	170 (62.0)	77 (28.1)	27 (9.9)	274 (100.0)	1.23 \pm 1.16
Total	484 (53.8)	291 (32.3)	125 (13.9)	900 (100.0)	
		p value ^a = 0.003*			p value ^c < 0.001*

[#]Not-significant

*Statistically significant

^aChi-square test

^bKruskal-Wallis test

^cMann-Whitney U test

Table 2: Distribution of study population according to plaque status among different age-groups and gender

Age category	Plaque status				Total N (%)	Mean ± SD
	Excellent n (%)	Good n (%)	Fair n (%)	Poor n (%)		
12 years	62 (20.4)	168 (55.3)	72 (23.7)	2 (0.7)	304 (100.0)	0.7 ± 0.54
13 years	82 (29.4)	137 (49.1)	53 (19.0)	7 (2.5)	279 (100.0)	0.63 ± 0.58
14 years	36 (22.6)	80 (50.3)	37 (23.3)	6 (3.8)	159 (100.0)	0.7 ± 0.57
15 years	24 (15.2)	92 (58.2)	39 (24.7)	3 (1.9)	158 (100.0)	0.75 ± 0.51
Total	204 (22.7)	477 (53.0)	201 (22.3)	18 (2.0)	900 (100.0)	0.68 ± 0.2
	<i>p</i> value ^a = 0.018*					0.146 [#]
Male	117 (18.7)	344 (55.0)	150 (24)	15 (2.4)	626 (100.0)	0.73 ± 0.55
Female	87 (31.8)	133 (48.5)	51 (18.6)	3 (1.1)	274 (100.0)	0.58 ± 0.54
Total	204 (22.7)	477 (53.0)	201 (22.3)	18 (2.0)	900 (100.0)	
	<i>p</i> value ^a < 0.001*					<0.001*

*Statistically significant

[#]Non-significant

^aChi-square test

Table 3: Distribution of study population according to gingival status among different age-groups and gender

Age category	Gingival status			Total N (%)	Mean ± SD
	Mild gingivitis n (%)	Moderate gingivitis n (%)	Severe gingivitis n (%)		
12 years	145 (47.7)	103 (33.9)	56 (18.5)	304 (100.0)	0.47 ± 0.6
13 years	150 (53.8)	88 (31.5)	41 (14.7)	279 (100.0)	0.38 ± 0.55
14 years	74 (46.5)	57 (35.8)	28 (17.6)	159 (100.0)	0.46 ± 0.6
15 years	66 (41.8)	66 (41.8)	26 (16.5)	158 (100.0)	0.48 ± 0.54
Total	435 (48.3)	314 (34.9)	151 (16.8)	900 (100.0)	0.44 ± 0.57
	<i>p</i> value ^a = 0.450 [#]				0.202 [#]
Male	278 (44.4)	234 (37.4)	114 (18.2)	626 (100.0)	0.49 ± 0.6
Female	157 (57.3)	80 (29.2)	37 (13.5)	274 (100.0)	0.32 ± 0.49
Total	435 (48.3)	314 (34.9)	151 (16.8)	900 (100.0)	
	<i>p</i> value ^a = 0.003*				<0.001*

*Statistically significant

[#]Non-significant

^aChi-square test

Table 4: Comparison of OHI-S score, PI score, and GI score with a frequency of cleaning teeth among the study population

Frequency of cleaning		Oral hygiene index-simplified	Plaque index	Gingival index
Once (1)	Mean	1.55	0.70	0.46
	SD	1.28	0.54	0.57
Two or more times a day (2)	Mean	1.26	0.57	0.32
	SD	1.30	0.56	0.54
Irregular (3)	Mean	2.69	1.18	0.95
	SD	1.32	0.61	0.74
Total	Mean	1.51	0.68	0.44
	SD	1.29	0.55	0.57
<i>p</i> value ^a		0.001*	0.001*	<0.001*
Post hoc comparison ^b		3 > 1 > 2	3 > 1 > 2	3 > 1 > 2

*Significant

^aPost hoc Bonferroni test

^bOne-way ANOVA test

and more than two times a day (0.1%). In the study by Shanbhog et al.,⁴ among 12- to 14-year-old orphanage children in Mysore district, Karnataka, 95.1% of orphans cleaned their teeth once daily, and Gaur et al.,¹⁷ most (99.4%) of the juvenile group children brushed their teeth once. However, all (100%) orphanage children cleaned their teeth once daily in the study by Ojahanon et al.⁶ and Sushanth et al.¹⁸

Cleaning of teeth twice daily was 18.70% among orphanage children in the present study. The current study was not in accordance with the studies done by Camacho et al.,¹⁹ in which 37.2% of the girls brushed their teeth two or more times a day and 62.8% brushed their teeth once daily, Singh et al.,¹² among 12-year-old Ashrama children in Udupi district, Karnataka, in which 66.6% of orphanage children brushed two or more times a day and Shanbhog et al.⁴ reported that 100.0% of orphanage children were cleaning their teeth twice daily. A better frequency of cleaning teeth was reported in these studies when compared with the present study.

In the present study, toothbrush (99.90%) and toothpaste (99.70%) were used by most of the orphanage children for cleaning

their teeth. The findings of the present study were in accordance with the studies were done by Singh et al.¹² (100.0%), Kumar et al.² (90.8%), Shanbhog et al.⁴ (100.0%), and Hans et al.¹⁰ (82%) of the orphanage children used toothbrush and toothpaste for cleaning their teeth.

Whereas this was in contrast with the studies reported by Srinivas et al.,⁵ Khare et al.,¹ Gupta et al.,⁷ and Al-Maweri et al.,²⁰ in which the use of toothbrush and toothpaste was much lower when compared with the present study. The non-availability of brushing aids (toothbrush and toothpaste), lack of financial resources, and lack of guidance, and assistance for brushing in these institutions could be the reason for this.¹⁷

The majority (53.3%) of the orphanage children in the present study had good oral hygiene status, followed by fair (41.1%) and poor (14.6%). However, in the study by Al-Jobair et al.,³ in which the OHI index by James et al. was used, the majority (75.6%) of the subjects had fair oral hygiene status, followed by poor (17.8%) and good (6.7%). The present study was in contrast with the studies by Shanbhog et al.,⁴ Gaur et al.,¹⁷ and Ojahanon et al.,⁶ 32.8%, 61.36%, and 21% of children, respectively, had poor oral hygiene index scores which were higher than the present study.

The oral hygiene status of the females (higher prevalence of good score) was found to be significantly better than male orphanage children (higher prevalence of fair and poor oral hygiene scores). Similar findings have been reported by Gaur et al.,¹⁷ the boys of the juvenile group had a poor OHI (61.36%) with comparatively better (58.97%) oral hygiene status among females, and Ojahanon et al.,⁶ poor oral hygiene status was more among males (29.4%) in comparison to female orphanage children (14.3%).

The poor oral hygiene was more in the males which may be related to the cumulative accumulation of deposits over the years and lack of guidance for the maintenance of proper oral hygiene. The number among females with poor oral hygiene status was less due to possible growing awareness about esthetics at puberty.⁶

The overall mean plaque score among orphans in the current study was 0.68 ± 0.20 . However, in the study carried out by Al-Jobair et al.,³ the mean plaque score among orphanage children was 1.35 ± 0.55 which was higher than that in the present study.

Several studies have shown that teaching in schools and institutions like orphanages can be effective in terms of improving both knowledge and health outcome measures.²¹⁻²³ It can be suggested that an oral health promotion program can be useful in improving the oral hygiene status of orphanage children.

The mean gingival score among orphanage children was 0.44 ± 0.57 in the present study which was not in agreement with the study carried out by Al-Jobair et al.,³ (1.0 ± 0.28) which was found to be a higher mean GI score compared to the present study.

The majority (48.3%) of the orphanage children in the present study had mild gingival status, followed by moderate (34.9%) and severe (16.8%). The findings of the current study were not in agreement with the study done by Mazhari et al.,²⁴ using the modified gingival index (MGI) criteria found that 67% of orphans had poor gingival scores.

A highly significant positive correlation between OHI-S and GI was reported by Shanbhog et al.,⁴ suggesting children with good oral hygiene have better gingival health status which was corresponding to the present study. Similarly, Al-Jobair et al.³ reported that the GI scores were found to be correlated with PI scores, as children with high mean GI scores had the highest mean

PI scores and those with lowest mean GI scores had the lowest mean PI scores. The better plaque and gingival scores in the present study might be attributed to the fact that nowadays oral hygiene aids are being funded by NGOs and a focus is there on the maintenance of oral health at these institutions.

The mean OHI-S score, PI score, and GI scores were found better among participants who were cleaning teeth two or more times a day comparative to once or irregular frequency of cleaning teeth. These results were in agreement with studies carried out by Khursheed et al.²⁵ among (20–40 years) young adult patients in Iraq, the highest mean plaque and gingival score were found in subjects with no brushing frequency and tends to decrease with increasing frequency of toothbrushing and Kuppuswamy et al.²⁶ among (10–16 years) school children, a much higher OHI-S score was found among never brushing teeth when compared more than two times a day and once daily frequency. It could be transiently associated with tooth eruption, and also due to a possibility that some of the school children did not brush as they claimed, and among adults, it could be due to short brushing time, or the use of an ineffective brushing technique.

The level of awareness of the caretakers (who spent most of the time of the day with them) toward oral health was not assessed. This could be a limitation as they can guide this special group well toward the maintenance of good oral hygiene.

CONCLUSION

Good oral hygiene index scores were found to be more among the 13-year age-group and poor was reported to be more among the 12- and 15-year age-group. Though, there was not much difference in the oral hygiene status across the age-groups. Females had better oral hygiene status and gingival status than males.

It is well known that there are threats to oral health across the lifespan. Regular orphanage-based programs of dental health education should be implemented and reinforced in this group along with their caretakers. The instructions to clean their teeth two times a day and oral hygiene should be practiced under the supervision of the caretaker.

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